Eleven new species in the genus *Amiota* (Diptera: Drosophilidae) from Southwest China

Yalian WANG, Hongwei CHEN①

Department of Entomology, South China Agricultural University, Guangzhou, Guangdong 510642, China

Abstract: Based on morphological and molecular evidences, eleven new species in the genus *Amiota* (Diptera: Drosophilidae) from Southwest China are described: *Amiota gigantomelania* **sp. nov.**, *A. medidehiscentia* **sp. nov.**, *A. multiprocessa* **sp. nov.**, *A. nigripes* **sp. nov.**, *A. semiannulata* **sp. nov.**, *A. brevifoliacea* **sp. nov.**, *A. uncinata* **sp. nov.**, *A. bifoliacea* **sp. nov.**, *A. geisson* **sp. nov.**, *A. nulliseta* **sp. nov.** and *A. policladia* **sp. nov.** The Automatic Barcode Gap Discovery (ABGD) method was employed to assess the limits of closely related species. In addition, *A. dilatifemorata* Cao & Chen, 2008 from Sichuan and Yunnan is recognized as a junior synonym of *A. atomia* Máca & Lin, 1993 from Taiwan.

Key words: Steganinae; fruit fly; Oriental Region; taxonomy

中国西南地区阿果蝇属十一新种（双翅目：果蝇科）

王亚莲，陈宏伟①

华南农业大学农学院昆虫学系，广东 广州 510642

摘要：基于形态学和分子证据，描述了采自中国西南地区阿果蝇属 11 新种：大黑阿果蝇 *Amiota gigantomelania* **sp. nov.**，中裂阿果蝇 *A. medidehiscentia* **sp. nov.**，多突阿果蝇 *A. multiprocessa* **sp. nov.**，黑足阿果蝇 *A. nigripes* **sp. nov.**，断环阿果蝇 *A. semiannulata* **sp. nov.**，短叶阿果蝇 *A. brevifoliacea* **sp. nov.**，钩叶阿果蝇 *A. uncinata* **sp. nov.**，双叶阿果蝇 *A. bifoliacea* **sp. nov.**，边寨阿果蝇 *A. geisson* **sp. nov.**，光叶阿果蝇 *A. nulliseta* **sp. nov.** 和多枝阿果蝇 *A. policladia* **sp. nov.**，并采用 ABGD 物种界定方法评估其与近缘物种的边界。此外，一个分布在四川和云南的新异名种被指正：*A. dilatifemorata* Cao & Chen, 2008, **syn. nov.**（= *A. atomia* Máca & Lin, 1993，台湾分布）。

关键词：冠果蝇亚科；果蝇；东洋区；分类

Introduction

The genus *Amiota* (Loew, 1862) (Diptera: Drosophilidae) is a large diverse genus in the subfamily Steganinae, comprised of 153 described species covering all biogeographic regions (Bächli 2020). These species predominantly occur in temperate to subtropical forests of the Northern Hemisphere. Only 15 species have radiated into the Southern Hemisphere. Among the 138 species in the Northern Hemisphere, 62 species are from the Palearctic Region, 104 species are from the Oriental Region and 10 species are from the Nearctic Region (Xu *et al.* 2007; Brake & Bächli 2008; Cao *et al.* 2008; He *et al.* 2009; Xu & Chen 2013; Zhao *et al.*

Accepted 8 June 2020. Published 25 September 2020. Published online 4 September 2020.

① Corresponding author, E-mail: hongweic@scau.edu.cn

2013; Shao *et al.* 2014; Wang *et al.* 2020). In China, the majority of species (about 54%) are found in high mountains (alt. 1400–2800 m): 75 species from the southwestern realm (along the Hengduan Mountains) and 21 species distributed along the Qinling to Shennongjia Mountains. In contrast, few species (about 28%) are sheltered in upland forests (alt. 200–700 m): 22 species from north of Qinling, 22 species along the Nanling Mountains to Hainan Island and 7 species from Taiwan. As the altitude drops, the species richness decreases gradually, suggesting a trend of outward radiations from Southwest China. Up until the present, seven species groups: *alboguttata* (49 spp.), *apodemata* (5 spp.), *basdeni* (23 spp.), *nagatai* (6 spp.), *rufescens* (4 spp.), *sinuata* (19 spp.) and *taurusata* (10 spp.), have been established based on morphological characters within this genus (Chen & Toda 1998a, b, 2001). However, 37 species still lack species group associations.

In the present study, eleven new species supported by morphological and molecular evidences are described in the following section on “Taxonomy”. Five species are in the *A. alboguttata* group, two belong to the *A. nagatai* group, while the remaining four are of uncertain affinity. One species, *A. dilatifemorata* Cao & Chen, 2008 from Sichuan and Yunnan, is recognized as a new synonym (as *A. atomia* Máca & Lin, 1993 from Taiwan). We extracted 52 barcoding sequences to assess their association with closely-related species.

Material and methods

Taxon sampling and DNA sequencing

All examined samples were captured from tree trunks near streams or around human eyes in the mountain forests (Table 1), then preserved in 75% ethanol. After morphological identification in the laboratory, a small piece of tissue was dissected for DNA extraction. Type specimens were then air-dried and deposited in the collection in the Department of Entomology, South China Agricultural University (SCAU), Guangzhou, China. The morphological terminology follows McAlpine (1981) and the definitions of measurements, indices, and abbreviations follow Chen & Toda (2001): BL — straight distance from anterior edge of pedicel to tip of abdomen; ThL — medial distance from anterior notal margin to apex of scutellum; WL — distance from humeral cross vein to wing apex; WW — maximum wing width; arb — dorsal/ventral branches of arista; avd — longest ventral/dorsal branch of arista in length; adf — longest dorsal branch of arista/width of first flagellomere; flw — length/width of first flagellomere; FW/HW — frontal width/head width; ch/o — maximum width of gena/diameter of eye; prorb — proclinate/posterior reclinate orbital in length; rcorb — anterior reclinate/posterior reclinate orbital in length; vb — subvibrissa/vibrissa in length; dcl — anterior/posterior dorsocentral in length; presctl — prescutellar/posterior dorsocentral in length; sctl — basal/apical scutellar in length; sterno — anterior/posterior katepisternal in length; orbito — distance between proclinate and posterior reclinate orbitals/distance between inner vertical and posterior reclinate orbital; dcp — distance between ipsilateral dorsocentrals/cross distance between anterior dorsocentrals; sctlp — distance between ipsilateral scutellars/cross distance between apical scutellars; C — second costal section between subcostal break and R_{2+3}/third costal section between R_{2+3} and R_{4+5}; 4c — third costal section between R_{2+3} and R_{4+5}/M_1 between r-m and dm-cu; 4v — M_1 between dm-cu and wing margin/M_1 between r-m and dm-cu; 5x — CuA_1 between dm-cu and wing margin/dm-cu between M_1 and CuA_1; ac — third costal section between R_{2+3} and R_{4+5}/distance between distal ends of R_{4+5} and M_1; M — CuA_1 between dm-cu and wing margin/M_1 between r-m and dm-cu; C3F — length of heavy setation in third costal section/(length of heavy setation in third costal section + length of light setation in third costal section).

DNA was extracted using the Magen HiPure Insect DNA Kit (Majorbio, China). The primer pairs (LCO1490: 5′-GGTCAACAAATCATAAAGATATTGG-3′, HCO2198: 5′-TAAACTTCAGGGTGACCAAAAAATCA-3′) from Folmer *et al.* (1994) were used for PCR and sequencing of *COI* fragments. MEGA 5.05 was used to inspect sequences and calculate the intra- and inter-specific pairwise p-distances (Table 2; Tamura *et al.* 2011). The intraspecific genetic distances range from 0.000 to 0.007, and the interspecific range from 0.018 to 0.101.

Table 1. Taxon sampling and GenBank accessions of the DNA sequences (* Sequences obtained from Wang *et al.* 2020; He *et al.* 2009)

Groups	Species	Localities	GenBank accession numbers
alboguttata	*A. albilabris* (Roth, 1860) –1	Guanmenshan, Benxi, Liaoning, China	MF102296*
	A. albilabris (Roth, 1860) –2	Guanmenshan, Benxi, Liaoning, China	MF102297*
	A. atomia Máca & Lin, 1993 –1	Baihualing, Baoshan, Yunnan, China	MF102314*
	A. atomia Máca & Lin, 1993 –2	Hutiaoxia, Shangrila, Yunnan, China	MF102315*
	A. atomia Máca & Lin, 1993 –3	Fengtongzai, Baoxing, Sichuan, China	MF102316*
	A. atomia Máca & Lin, 1993 –4	Fengtongzai, Baoxing, Sichuan, China	MT356952
	A. setosa Zhang & Chen, 2006 –1	Haoping, Ziyang, Shaanxi, China	MF102347*
	A. setosa Zhang & Chen, 2006 –2	Dajiuhu, Shennongjia, Hubei, China	MF102346*
	A. setosa Zhang & Chen, 2006 –3	Foping, Qinling, Shannxi, China	MT356953
	A. setosa Zhang & Chen, 2006 –4	Fengtongzai, Baoxing, Sichuan, China	MT356954
	A. gigantomelania **sp. nov.** –1	Hutiaoxia, Shangrila, Yunnan, China	MT356955
	A. gigantomelania **sp. nov.** –2	Gexigou, Yajiang, Sichuan, China	MT356956
	A. medidehiscentia **sp. nov.**	Mengdong, Cangyuan, Yunnan, China	MT356957
	A. multiprocessa **sp. nov.**	Mengdong, Cangyuan, Yunnan, China	MT356958
	A. nigripes **sp. nov.**	Jizushan, Binchuan, Dali, China	MT356959
	A. semiannulata **sp. nov.**	Menglai, Cangyuan, Yunnan, China	MT356960
nagatai	*A. nagatai* Okada, 1971 –1	Nanling, Shaoguan, Guangdong, China	MT356961
	A. nagatai Okada, 1971 –2	Liuxihe, Conghua, Guangdong, China	JQ676820*
	A. protuberantis Cao & Chen, 2009 –1	Jianfengling, Ledong, Hainan, China	MF102372*
	A. protuberantis Cao & Chen, 2009 –2	Longtan Park, Ximeng, Yunnan, China	MT356962
	A. brevifoliacea **sp. nov.** –1	Muyiji, Ximeng, Yunnan, China	MT356963
	A. brevifoliacea **sp. nov.** –2	Muyiji, Ximeng, Yunnan, China	MT356964
	A. brevifoliacea **sp. nov.** –3	Mengdong, Cangyuan, Yunnan, China	MT356965
	A. uncinata **sp. nov.** –1	Murray Falls, Ruili, Yunnan, China	MT356966
	A. uncinata **sp. nov.** –2	Simao, Pu’er, Yunnan, China	MT356967
	A. uncinata **sp. nov.** –3	Mengma, Menglian, Yunnan, China	MT356968

Continued Table 1

Groups	Species	Localities	GenBank accession numbers
	A. uncinata **sp. nov.** –4	Muyiji, Ximeng, Yunnan, China	MT356969
	A. uncinata **sp. nov.** –5	Mengma, Menglian, Yunnan, China	MT356970
Ungrouped	*A. albidipuncta* Xu & Chen, 2007 –1	Fengtongzai, Baoxing, Sichuan, China	MT356971
	A. albidipuncta Xu & Chen, 2007 –2	Fengtongzai, Baoxing, Sichuan, China	MT356972
	A. albidipuncta Xu & Chen, 2007 –3	Mulinzi, Hefeng, Hubei, China	MT356973
	A. albidipuncta Xu & Chen, 2007 –4	Mulinzi, Hefeng, Hubei, China	MT356974
	A. fuscata Chen & Zhang, 2005 –1	Baihualing, Baoshan, Yunnan, China	MT356975
	A. fuscata Chen & Zhang, 2005 –2	Ailaoshan, Lüchun, Yunnan, China	MT356976
	A. fuscata Chen & Zhang, 2005 –3	Baihualing, Baoshan, Yunnan, China	MT356977
	A. fuscata Chen & Zhang, 2005 –4	Mengdong, Cangyuan, Yunnan, China	MT356978
	A. fuscata Chen & Zhang, 2005 –5	Mengdong, Cangyuan, Yunnan, China	MT356979
	A. kamui Chen & Toda, 2001 –1	Guanmenshan, Benxi, Liaoning, China	MT356980
	A. kamui Chen & Toda, 2001 –2	Emeishan, Leshan, Sichuan, China	MT356981
	A. kamui Chen & Toda, 2001 –3	Gexigou, Yajiang, Sichuan, China	MT356982
	A. kamui Chen & Toda, 2001 –4	Fengtongzai, Baoxing, Sichuan, China	MT356983
	A. kamui Chen & Toda, 2001 –5	Gexigou, Yajiang, Sichuan, China	MT356984
	A. bifoliacea **sp. nov.** –1	Wuliangshan, Mengla, Yunnan, China	MT356985
	A. bifoliacea **sp. nov.** –2	Muyiji, Ximeng, Yunnan, China	MT356986
	A. bifoliacea **sp. nov.** –3	Muyiji, Ximeng, Yunnan, China	MT356987
	A. bifoliacea **sp. nov.** –4	Muyiji, Ximeng, Yunnan, China	MT356988
	A. bifoliacea **sp. nov.** –5	Hesong, Menghai, Yunnan, China	MT356989
	A. geisson **sp. nov.**	Mengdong, Cangyuan, Yunnan, China	MT356990
	A. nulliseta **sp. nov.**	Yixiang, Pu’er, Yunnan, China	MT356991
	A. policladia **sp. nov.** –1	Gexigou, Yajiang, Sichuan, China	MT356992
	A. policladia **sp. nov.** –2	Gexigou, Yajiang, Sichuan, China	MT356993
	A. policladia **sp. nov.** –3	Gexigou, Yajiang, Sichuan, China	MT356994

Table 2. Summary of genetic distances of *COI* gene

Species	N	Min. intra./Max. intra./Mean intra. Vari.	Min. inter./Max. inter./ Mean inter. Vari.	Species with Min. inter.
A. bifoliacea	5	0.002/0.007/0.004±0.002	0.022/0.138/0.103±0.029	*A. fuscata*
A. brevifoliacea	3	0.002/0.004/0.002±0.001	0.059/0.153/0.107±0.026	*A. nagatai*
A. geisson	1	NA/NA/NA	0.081/0.126/0.101±0.011	*A. kamui*
A. gigantomelania	2	0.000	0.101/0.158/0.133±0.019	*A. setosa*
A. medidehiscentia	1	NA/NA/NA	0.027/0.135/0.095±0.030	*A. dilatifemorata*
A. multiprocessa	1	NA/NA/NA	0.018/0.135/0.107±0.023	*A. nigripes*
A. nigripes	1	NA/NA/NA	0.018/0.133/0.107±0.023	*A. multiprocessa*
A. nulliseta	1	NA/NA/NA	0.054/0.135/0.094±0.019	*A. kamui*
A. policladia	3	0.000/0.004/0.002±0.002	0.056/0.158/0.120±0.025	*A. albidipuncta*
A. semiannulata	1	NA/NA/NA	0.076/0.146/0.118±0.021	*A. medidehiscentia*
A. uncinata	5	0.000/0.004/0.001±0.001	0.050/0.153/0.118±0.028	*A. nagatai*

Species delimitation

The closely-related species boundaries were assessed with the Automatic Barcode Gap Discovery (ABGD) method (Puillandre *et al.* 2012), which was performed on the web server (http://wwwabi.snv.jussieu.fr/public/abgd/abgdweb.html) under the Kimura 2-parameter model. The relative gap width (X) was set to 0.5, and the P values ranged from 0.001 to 0.1 in ten steps.

Results and discussion

Here, the validity of the eleven new species from Southwest China was supported by the morphological and barcoding information, allowing unambiguous separation from their most related taxa. Their species boundaries were assessed using the single-locus species delimitation method, ABGD. The results are in agreement with the morphological taxonomy, except *A. multiprocessa* **sp. nov.** and *A. nigripes* **sp. nov.** collapsed into a single taxon. However, the high levels of genital variations (Figs. 3, 4) and large interspecific genetic divergence (1.8% in Table 2) maintained their species boundaries.

Within *Amiota*, male genital variations provide a good indication for relationships among closely-related species, even surpassing molecular information in some cases (e.g. Wang *et al.* 2020). With increasing species documentation, however, the real processes and patterns behind the species diversification and functional adaptions of genitalia are sources for further research. This increased availability of morphological and molecular information for the genus *Amiota* will allow future large-scale phylogenetic analyses combining these data sets, which will help us understand the factors that have driven the diversification of phenotypic traits and reveal a more complete understanding of the mechanisms of evolution in this genus.

Currently, the discoveries of these eleven new species from Sichuan and Yunnan once again reinforce the hypothesis that Southwest China is a center of origin and diversification of drosophilids in East Asia (Cao *et al.* 2011; Li *et al.* 2013; Lu *et al.* 2018). Among the seven established species groups, this origin and outward radiation (from the Tropic of Cancer to central and northern areas) has been raised within the *A. alboguttata*, *A. basdeni* and *A. taurusata* groups (Shao *et al.* 2014; Wang *et al.* 2020). Meanwhile, more than 96% of species of the *A. apodemata*, *A. nagatai* and *A. sinuata* groups are observed in the Oriental Region, distributed from Kyushu, Japan to Queensland, Australia, and generally showing a trend of southward diffusion from the Tropic of Cancer. These remarkable changes in geographical distribution patterns are often associated with adaptive pressures on morphological evolution (e.g. size reduction, depigmentation, convergence or loss of leg projections, etc.), but less is known about how this may affect interspecific divergence.

Taxonomy

Genus *Amiota* Loew

Amiota Loew, 1862: 229; Máca, 2003: 255 (revised status). Type species: *Amiota leucostoma* Loew, 1862.

Amiota (s. str.): Wheeler, 1952: 166.

Diagnosis. Face, postpronotal lobe and wing base each with a distinctly milky white spot; clypeus unicoloured, dark brown to black; aedeagal apodeme broad, dorsoventrally flattened; a few anterior sensilla of medial cibarials short, somewhat peg-like (Chen & Toda 2001).

Eyes dark reddish brown. Anterior reclinate orbital slightly shorter than other orbitals. Frons slightly pruinose, with a few minute, interfrontal setulae. Pedicel and first flagellomere almost grayish yellow; arista plumose, without terminal fork. Palpus larger in female than in male, mostly grayish yellow, with several stout setae on lateral margin. Vibrissa prominent; other orals small. Postgena brownish black. Occiput glossy, brownish black.

Thorax slightly glossy, usually brownish black to black, except a small number of species having yellow thorax. One postpronotal seta. Acrostichal setulae in ca. 12 irregular rows. Prescutellar setae present except for the *sinuata* group. Scutellum unicoloured. Basal scutellar setae divergent; apicals cruciate.

Wing hyaline. Veins grayish yellow; crossveins clear. Basal medial-cubital crossvein present. Costal vein with spinules variable in size and number on ventral surface between R_{2+3} and R_{4+5}. C_1 setae two, less differentiated. R_{2+3} slightly curved to costa at tip; R_{4+5} and M_1 slightly convergent distally. Halteres white.

Legs usually yellow, but dark brown in a few species. Fore femur with two to three irregular, posterior rows of setae. Apical seta present on mid tibia; preapical dorsal setae present on all tibiae. Mid tarsus mostly with one row of minute cuneiform setulae ventrally; hind tarsus with one row of such setulae. First tarsomeres of fore- and hind legs slightly shorter than remaining tarsomeres combined; mid first tarsomere as long as remaining combined; second tarsomere usually about twice as long as wide.

Abdominal tergites glossy, usually brown to brownish black, yellow to brownish yellow in a few species; first and second medially paler. Sternites pale grayish yellow; first small, lacking pubescence; second to sixth (♂) or seventh (♀) pubescent and setigerous.

Male terminalia. Epandrium with a number of setae near posterior to ventral margins; apodeme less-developed. Surstylus with a row of prensisetae on distal margin and several setae apically. Tenth sternite laterally fused to surstyli and with a pair of lobe-like processes, contiguous dorsally to cerci and ventrally to gonopod. Cercus separated from epandrium, entirely pubescent and setigerous. Membrane between epandrium and cercus pubescent. Hypandrium usually narrow and arcuate. Gonopods almost fused to each other, forming posteromedian plate, anteriorly forming vertical process, posterolaterally contiguous to posterior ends of hypandrium and anteroventral corners of epandrium. Parameres usually basally contiguous to arms of aedeagal apodeme. Aedeagus usually present and sclerotized; outer membrane less-developed; apodeme with a pair of arms.

Female terminalia. Seventh tergite usually separated into lateral lobes mid-dorsally. Eighth sternite (oviscapt) not bilobed. Pregenital lamella usually sclerotized, partly bilobed, present posteriorly to eighth sternite. Spermatheca dark brown, usually with numerous, minute, apically round, mold-like processes over outer surface; duct not introverted into capsule.

Amiota alboguttata **species group**

Amiota (*Amiota*) *alboguttata* species group: Chen & Toda, 2001: 1537.

Diagnosis. Male. Hind tibia with a row of long ventral setae; hind second to fifth tarsomeres broadened: second shorter than half its width.

1. ***Amiota gigantomelania*** **sp. nov.** (Fig. 1)

Description. Male. Hind trochanter with 1 lobe-like process (Fig. 1E), femur slightly extended on basal ventral surface (Fig. 1F). Male terminalia (Figs. 1A–D): Epandrium entirely separated mid-dorsally, with ca. 27 setae near posterior to ventral margins. Surstylus with finger-like process at posteroventral corner and ca. 7 long prensisetae on distal margin. Anterior portion of hypandrium narrowly separated. Paramere with 5 sensilla, submedially fused to aedeagus. Aedeagus strongly sclerotized, pointed apically. Aedeagal apodeme strongly curved.

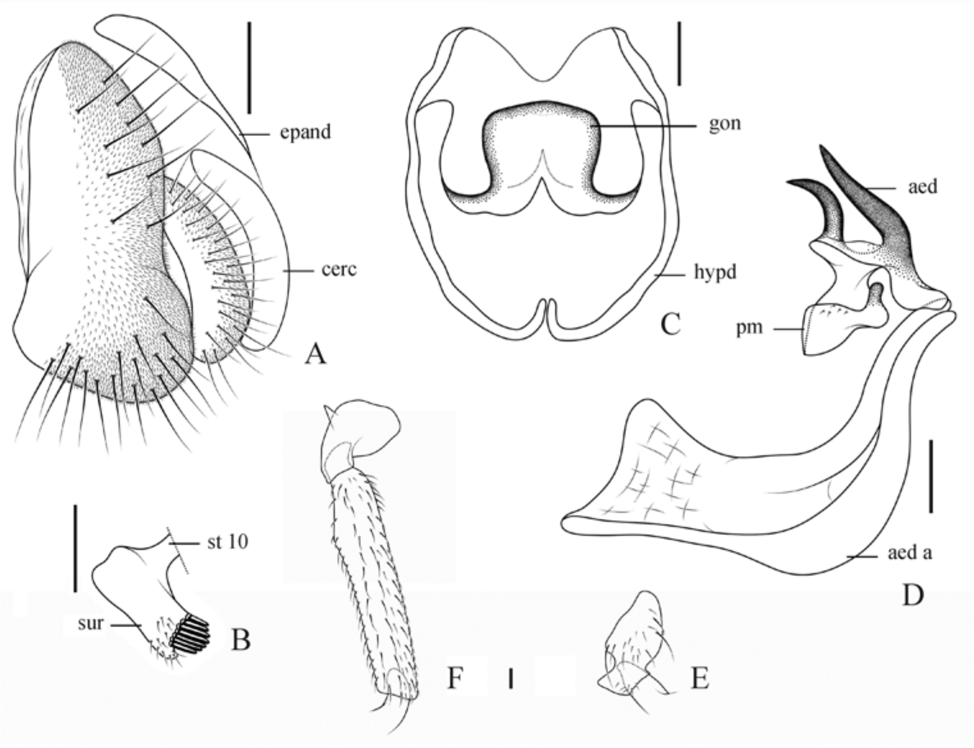

Figure 1. *Amiota gigantomelania* **sp. nov.** A. Epandrium (epand) and cercus (cerc), lateral view; B. Surstylus (sur) and 10th sternite (st 10), ventral view; C. Hypandrium (hypd) and gonopod (gon), ventral view; D. Parameres (pm), aedeagus (aed) and aedeagal apodeme (aed a), lateral view; E. Hind trochanter, postventral view; F. Hind femur, postventral view. Scale bars = 0.1 mm.

Measurements and indices. BL = 4.69 mm (4.00–4.65 mm in 3♂ paratypes), ThL = 2.50 mm (2.15–2.33 mm), WL = 4.50 mm (4.15–4.25 mm), WW = 2.00 mm (1.87–2.00 mm), arb = 6/4 (5–7/4), avd = 0.50 (0.50–0.88), adf = 0.75 (0.75–1.33), flw = 1.63 (1.63–2.00), FW/HW = 0.49 (0.42–0.47), ch/o = 0.15 (0.09–0.17), prorb = 1.33 (1.00–1.22), rcorb = 0.67 (0.69–0.78), vb = 0.30 (0.43–0.44), dcl = 0.73 (0.54–0.55), presctl = 0.80 (0.55–0.72), sctl = damaged (1.00–1.05), sterno = damaged (0.71–0.80), orbito = 1.50 (1.47–1.80), dcp = 0.26 (0.2–0.35), sctlp = 0.75 (1.00–1.25), C = 3.21 (2.40–3.24), 4c = 1.27 (1.13–1.25), 4v = 3.18 (2.22–2.87), 5x = 1.14 (1.00), ac = 2.80 (2.83–3.14), M = 0.73 (0.44–0.60), C3F = 0.57 (0.63–0.74).

Holotype. ♂ (SCAU, DIP 122872), **China,** Yunnan, Yulongnaxi, Hutiaoxia, 27°11′24″N, 100°02′55″E, alt. 1700 m, 22-VIII-2011, Hongwei CHEN. **Paratypes.** 2♂ (SCAU, DIP 122873, 74), same data as holotype, 24-VIII-2011; 1♂ (SCAU, DIP 124843), **China,** Sichuan, Yajiang, Gexigou, 30°02′58″N, 100°57′36″E, alt. 2713 m, 08-VII-2017, Yalian WANG.

Diagnosis. This species resembles *A. dilatifemorata* Cao & Chen, 2008 in the morphological characters, but can be distinguished from it by the paramere basally expanded and upturning (Fig. 1D); gonopods slightly bulging on the apex (Fig. 1C). In *A. dilatifemorata*, paramere distally not upturned; gonopods round apically (Figs. 4, 6 in Cao *et al.* 2008).

Etymology. The specific epithet is a combination of the Greek words: *gigantos* + *melan*-, referring to the large body size and black.

Distribution. China (Yunnan, Sichuan).

2. ***Amiota medidehiscentia* sp. nov.** (Fig. 2)

Description. Male terminalia (Figs. 2). Epandrium entirely separated mid-dorsally, with ca. 30 setae along posterior to ventral margins. Surstylus with 6 long setae on outer surface, a finger-like process at posteroventral corner and ca. 11 long prensisetae on distal margin. Anterior portion of hypandrium broadly separated. Vertical lobe of gonopod sclerotized and slightly protruded apically. Paramere slender, with 1 sensillum basally. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 3.51 mm, ThL = 1.59 mm, WL= 2.61 mm, WW = 1.17 mm, arb = 5/3, avd = 0.71, adf = 1.35, flw = 1.80, FW/HW = 0.45, ch/o = 0.14, prorb = 0.69, rcorb = 0.76, vb = 0.55, dcl = damaged, presctl = damaged, sctl = damaged, sterno = 1.37, orbito = 1.88, dcp = 0.23, sctlp = 1.15, C = 2.10, 4c = 1.60, 4v = 2.95, 5x = 0.98, ac = 3.30, M = 0.64, C3F = 0.80.

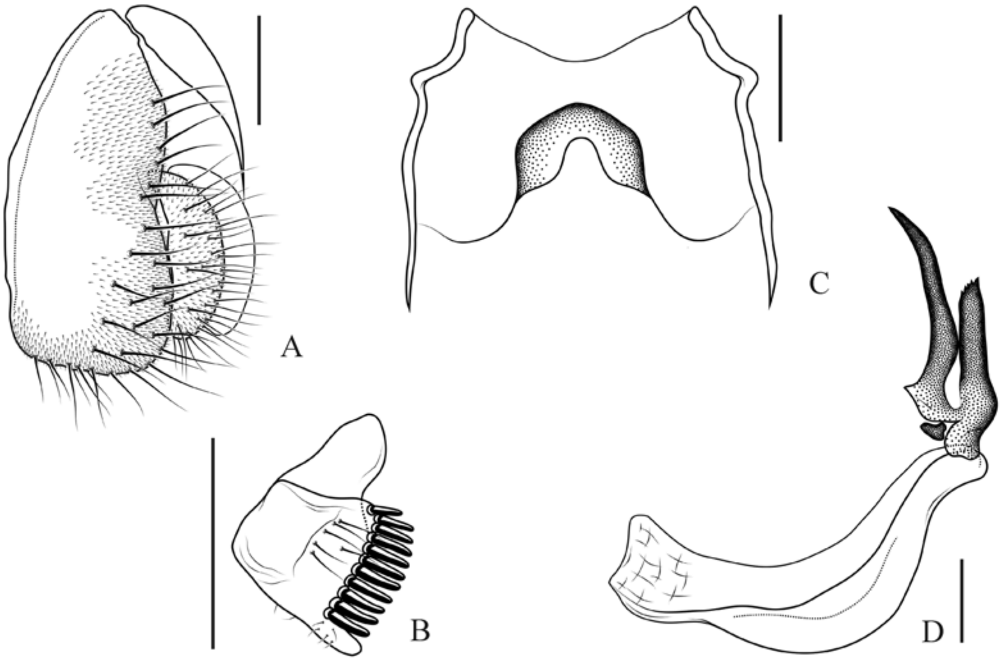

Figure 2. *Amiota medidehiscentia* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Parameres, aedeagus and aedeagal apodeme, lateral view. Scale bars = 0.1 mm.

Holotype. ♂ (SCAU, DIP 122875), **China,** Yunnan, Cangyuan, Mengdong, 23°10′08″N, 99°13′52″E, alt. 1323 m, 06-V-2016, Yalian WANG.

Diagnosis. This species is slightly related to *A. albilabris* (Roth, 1860) in the genitals characters, but can be differentiated from it by the aedeagus apically serrated, shorter than paramere (Fig. 2D). In *A. albilabris*, aedeagus apically pointed, as long as paramere (Figs. 10, 11 in Máca 1980).

Etymology. The specific epithet is a combination of the Latin words: *medius* + *dehisco*, referring to anterior portion of hypandrium being broadly separated.

Distribution. China (Yunnan).

3. ***Amiota multiprocessa* sp. nov.** (Fig. 3)

Description. Male. Hind femur extended basoventrally (Fig. 3E). Male terminalia (Fig. 3A–D). Epandrium entirely separated mid-dorsally, with ca. 43 setae on posterior to ventral margins. Surstylus with finger-like process at posteroventral corner and ca. 10 long prensisetae on distal margin. Anterior portion of hypandrium broadly separated. Vertical lobe of gonopod sclerotized and protruded apically. Paramere small, with 3 sensilla. Aedeagal apodeme strongly curved.

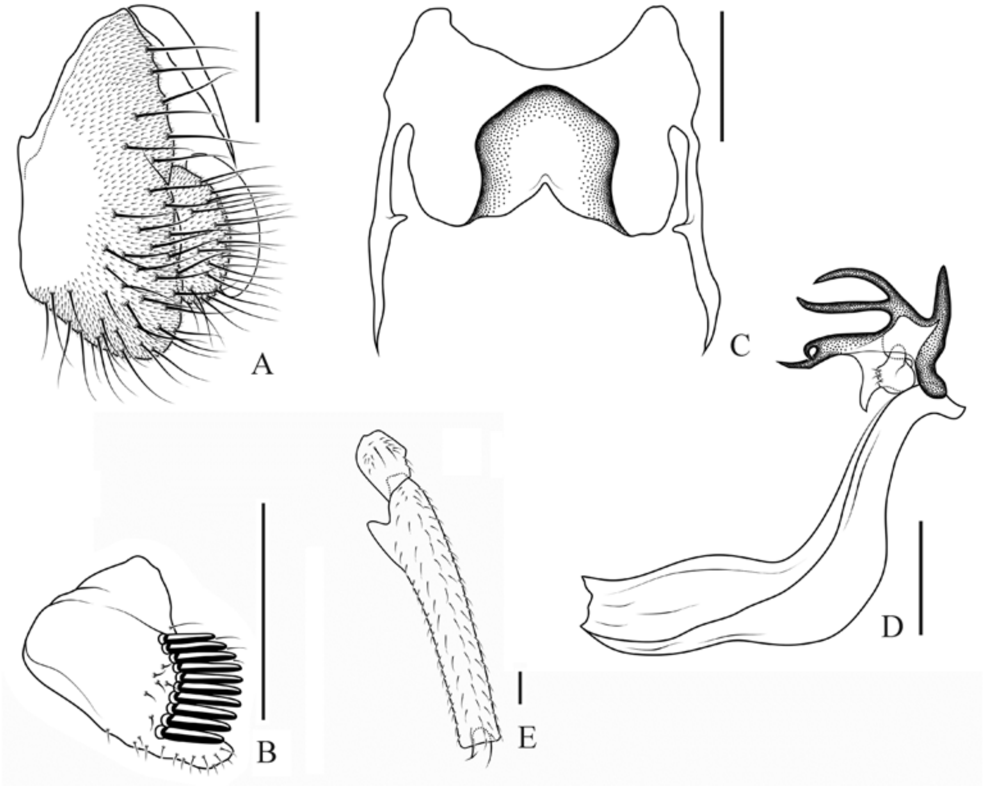

Figure 3. *Amiota multiprocessa* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Parameres, aedeagus and aedeagal apodeme, lateral view; E. Hind femur, postventral view. Scale bars = 0.1 mm.

Measurements and indices. BL = 3.19 mm (3.01 mm in 1♂ paratype), ThL = 1.45 mm

(1.34 mm), WL = 2.36 mm (2.25 mm), WW = 1.09 mm (0.97 mm), arb = 5/4 (4/4), avd = 0.35 (0.50), adf = 1.25 (1.04), flw = 1.35 (1.89), FW/HW = 0.44 (0.43), ch/o = 0.11 (0.12), prorb = 1.22 (1.12), rcorb = 0.59 (0.77), vb = 0.38 (0.38), dcl = 0.74 (0.54), presctl = 0.82 (0.65), sctl = damaged (1.17), sterno = 0.74 (0.82), orbito = 1.75 (1.40), dcp = 0.19 (0.20), sctlp = 1.02 (1.14), C = 2.11 (2.00), 4c = 1.39 (1.47), 4v = 2.57 (2.65), 5x = 1.12 (1.04), ac = 4.32 (4.16), M = 0.59 (0.55), C3F = 0.68 (0.67).

Holotype. ♂ (SCAU, DIP 112274), **China,** Yunnan, Cangyuan, Mengdong, 23°10′08″N, 99°13′52″E, alt. 1323 m, 06-V-2016, Yalian WANG. **Paratype.** 1♂ (SCAU, DIP 112275), same data as holotype.

Diagnosis. This species is similar to *A. nigripes* **sp. nov.** in male terminalia, but can be distinguished from it by the aedeagus with four strongly sclerotized slender processes and one less sclerotized lobate process fused to the base of paramere (Fig. 3D). In *A. nigripes* **sp. nov.**, the paramere has four sclerotized processes fused to the base of small aedeagus (Fig. 4D).

Etymology. The specific epithet is a combination of the Latin words: *multus* + *processus*, referring to the aedeagus with multiple processes.

Distribution. China (Yunnan).

4. ***Amiota nigripes*** **sp. nov.** (Fig. 4)

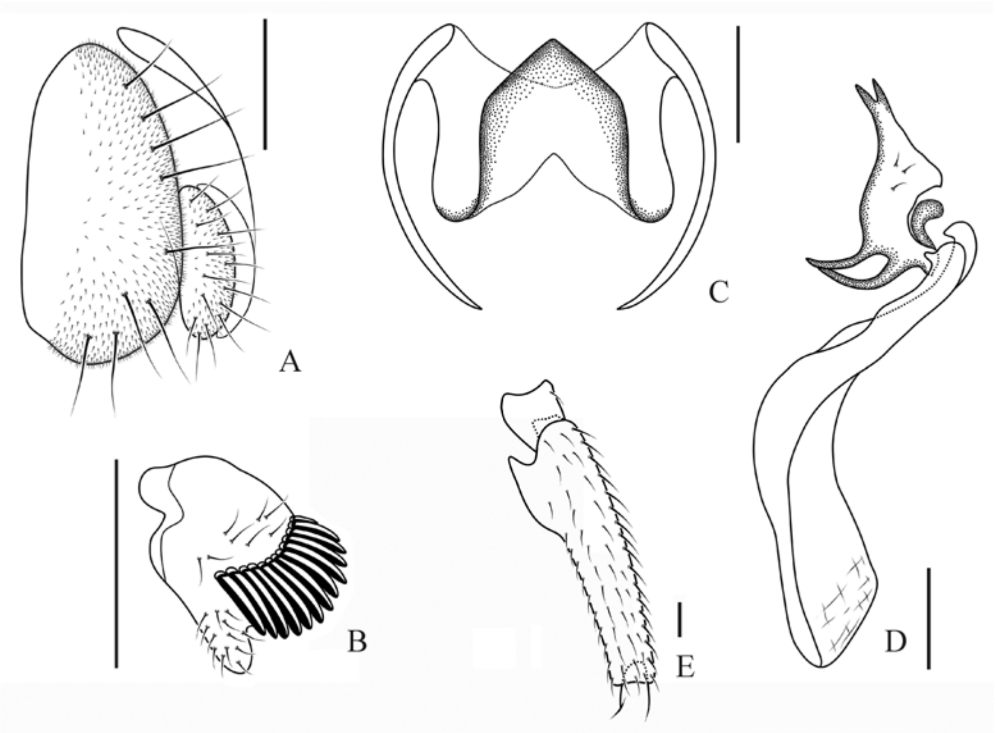

Figure 4. *Amiota nigripes* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Parameres, aedeagus and aedeagal apodeme, lateral view; E. Hind femur, postventral view. Scale bars = 0.1 mm.

Description. Male. Hind femur extended basoventrally (Fig. 4E). Male terminalia (Figs. 4A–D). Epandrium entirely separated mid-dorsally, with ca. 9 setae along posterior to ventral margins. Surstylus with finger-like process at posteroventral corner and ca. 12 long prensisetae on distal margin. Anterior portion of hypandrium broadly separated. Vertical lobe of gonopod sclerotized and protruded apically. Paramere with 3 sensilla submedially. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 3.25 mm, ThL = 1.60 mm, WL= 2.65 mm, WW = 1.25 mm, arb = 4/damaged, avd = damaged, adf = 1.17, flw = 1.83, FW/HW = 0.63, ch/o = 0.09, prorb = damaged, rcorb = damaged, vb = 0.57, dcl = 0.72, presctl = 0.61, sctl = 1.65, sterno = 0.88, orbito = 1.75, dcp = 0.23, sctlp = 1.00, C = 2.53, 4c = 1.13, 4v = 2.33, 5x = 1.29, ac = 3.40, M = 0.60, C3F = 0.72.

Holotype. ♂ (SCAU, DIP 122869), **China,** Yunnan, Binchuan, Jizushan, 25°56′54″N, 100°23′58″E, alt. 1900 m, 23-VII-2006, Huiluo CAO.

Diagnosis. This species is slightly related to *A. setosa* Zhang & Chen, 2006 in paramere apically bifurcated, but can be distinguished from it by the paramere subbasally with 2 slender processes and aedeagus fused to the base of paramere (Fig. 4D). In *A. setosa*, the paramere and aedeagus are fused each other basomedially (Fig. 51 in Zhang & Chen 2006).

Etymology. The specific epithet is a combination of the Latin words: *niger* + *pedis,* referring to the black legs.

Distribution. China (Yunnan).

5. ***Amiota semiannulata*** **sp. nov.** (Figs. 5A–E)

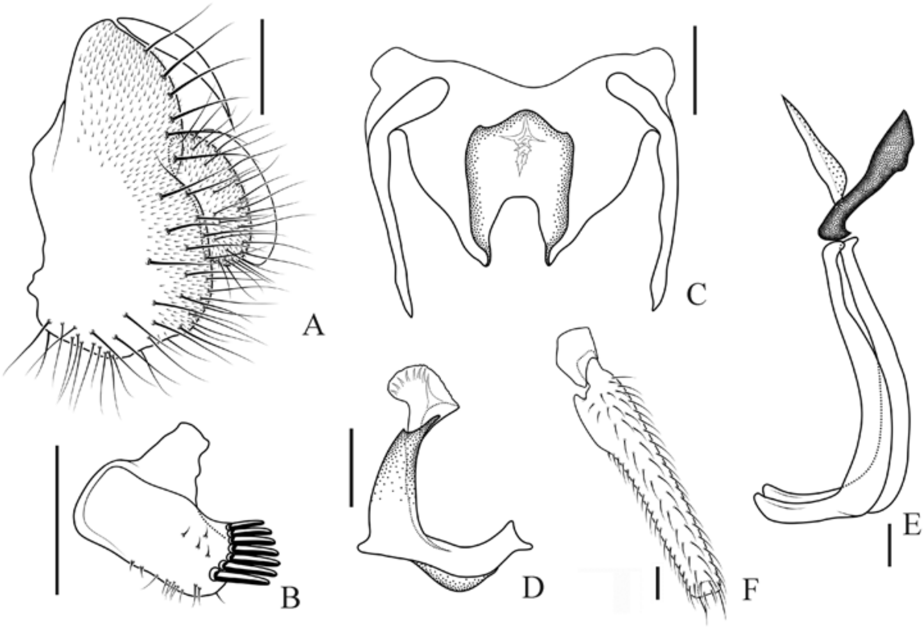

Figure 5. A–E: *Amiota semiannulata* **sp. nov.**, F: *Amiota. atomia* Máca & Lin, 1993. A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Gonopod, lateral view; E. Parameres, aedeagus and aedeagal apodeme, lateral view; F. Hind femur, postventral view. Scale bars = 0.1 mm.

Description. Male terminalia (Figs. 5A–E). Epandrium entirely separated mid-dorsally, with ca. 44 setae along posterior to ventral margins. Surstylus with ca. 7 long prensisetae on distal margin. Anterior portion of hypandrium broadly separated. Vertical lobe of gonopod slightly sclerotized and protruded apically. Paramere lacking sensilla. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 3.99 mm, ThL = 1.85 mm, WL= 2.82 mm, WW = 1.31 mm, arb = 6/4, avd = 0.88, adf = 1.17, flw = 1.46, FW/HW = 0.36, ch/o = 0.10, prorb = 1.11, rcorb = 0.80, vb = 0.46, dcl = damaged, presctl = damaged, sctl = damaged, sterno = damaged, orbito = 1.44, dcp = 0.26, sctlp = 1.02, C = 2.44, 4c = 1.23, 4v = 2.63, 5x = 1.19, ac = 3.66, M = 0.62, C3F = 0.77.

Holotype. ♂ (SCAU, DIP 112276), **China,** Yunnan, Cangyuan, Menglai Grand Canyon, 23°13′20″N, 99°15′04″E, alt. 1241 m, 30-X-2017, Hongwei CHEN.

Diagnosis. This species is diagnosed by strongly sclerotized paramere with a little corniform process basally and expanded proximally; aedeagus slightly sclerotized, basally fused to paramere (Fig. 5E).

Etymology. The specific epithet is a combination of the Latin words: *semi-* + *annulatus*, referring to the hypandrium being anteromedially separated.

Distribution. China (Yunnan).

6. ***Amiota atomia* Máca & Lin, 1993** (Fig. 5F)

Amiota atomia Máca & Lin, 1993: 3.

Amiota dilatifemorata Cao & Chen, 2008 in Cao *et al*. 2008: 195. syn. nov.

Specimen examined. ♂ (Holotype), **China,** Taiwan, Chitou, Nantou County, 01-X-1971, Feijann LIN and CHENG; 1♂, **China,** Yunnan, Baoshan, Baihualing, 25°17′50″N, 98°48′12″E, alt. 1241 m, 11-VI-2011, Hongwei CHEN; 1♂, **China,** Yunnan, Diqing, Hutiaoxia, 27°11′24″N, 100°02′55″E, alt. 1800 m, 21-VIII-2011, Hongwei CHEN; 2♂, **China,** Yunnan, Baoxing, Fengtongzhai, 30°32′42″N, 102°54′24″E, alt. 1400 m, 10-VII-2007, 15-VII-2017, Hongwei CHEN & Yiqin LIU.

Distribution. China (Taiwan, Sichuan, Yunnan).

***Amiota nagatai* species group**

Amiota (*Amiota*) *nagatai* species group: Chen & Toda, 2001: 1529.

Diagnosis. Hind trochanter with 1 lobe-like process; aedeagus bilobate, basal-medially fused with each other.

7. ***Amiota brevifoliacea* sp. nov.** (Fig. 6)

Description. Male terminalia (Figs. 6A–E). Epandrium constricted more than 1/2 width mid-dorsally, with ca. 13 setae near posterior and ventral margins. Surstylus with finger-like process at posteroventral corner and ca. 7 prensisetae on distal margin. Anterior portion of hypandrium broadened and slightly invaginated. Vertical lobe of gonopod round apically. Paramere fused to the middle of aedeagus, with ca. 7 sensilla. Aedeagus bilobate, fused medially. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 2.48 mm (2.19–2.70 mm in 5♂ paratypes), ThL = 1.19 mm (1.03–1.23 mm), WL = 2.01 mm (1.77–2.12 mm), WW = 0.96 mm (0.73–0.90 mm), arb = 3/2 (3–4/2), avd = 0.93 (0.87–0.88), adf = 1.44 (1.46–1.68), flw = 1.41 (1.34–1.41), FW/HW = 0.40 (0.39–0.47), ch/o = 0.09 (0.08–0.13), prorb = damaged (0.90–0.92), rcorb = 0.58

(0.57–0.68), vb = 0.50 (0.41–0.47), dcl = 0.43 (0.44–0.60), presctl = 0.53 (0.42–0.46), sctl = 1.09 (1.15–1.21), sterno = damaged (0.88–0.95), orbito = 1.92 (1.70–1.88), dcp = 0.23 (0.21–0.26), sctlp = 1.05 (1.03–1.06), C = 1.58 (1.51–1.53), 4c = 1.71 (1.55–1.75), 4v = 2.35 (2.42–2.85), 5x = 1.78 (1.37–1.95), ac = 5.05 (4.91–5.58), M = 0.83 (0.60–0.85), C3F = 0.80 (0.75–0.82).

Holotype. ♂ (SCAU, DIP 112260), **China,** Yunnan, Cangyuan, Mengdong, 23°10′08″N, 99°13′52″E, alt. 1323 m, 20-IV-2018, Hongwei CHEN. **Paratypes.** 5♂ (SCAU, DIP 112261–65), **China,** Yunnan, Ximeng, Muyiji, 22°37′15″N, 99°35′42″E, alt. 1203 m, 29-IV-2016, Yalian WANG.

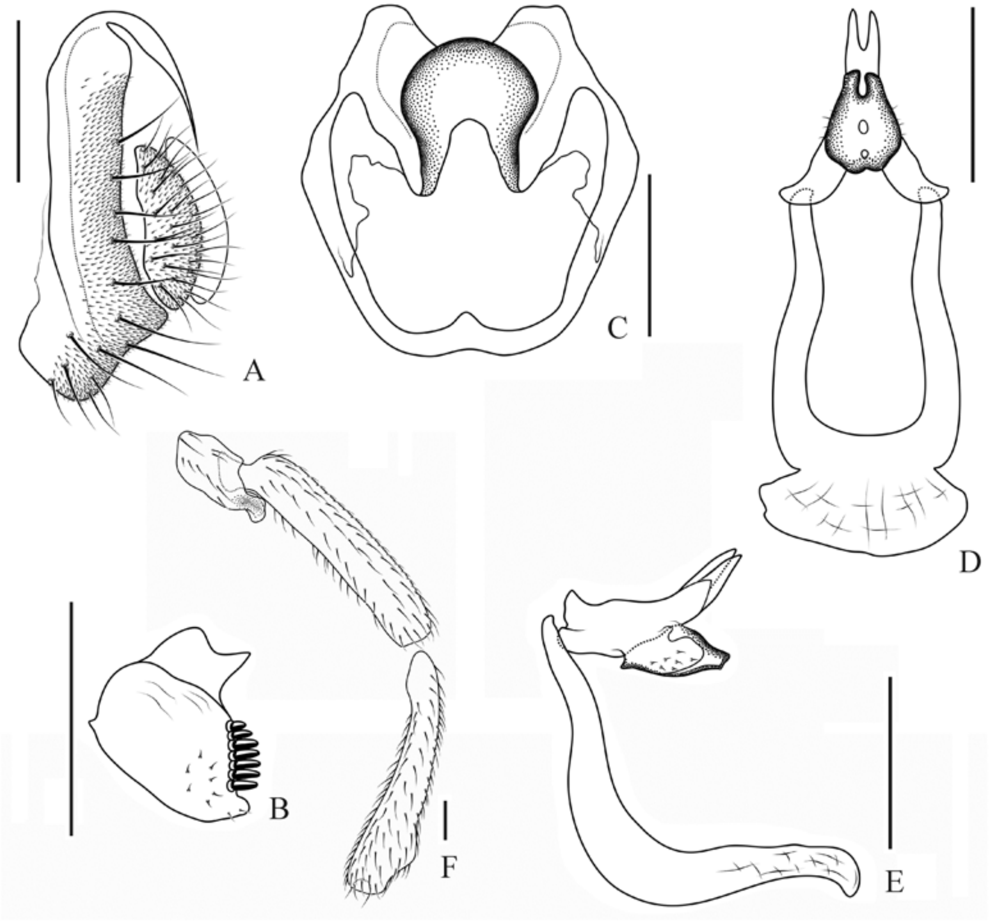

Figure 6. *Amiota brevifoliacea* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D, E. Parameres, aedeagus and aedeagal apodeme, ventral and lateral views; F. Hind femur and tibia, postventral view. Scale bars = 0.1 mm.

Diagnosis. This species is similar to *A. protuberantis* Cao & Chen, 2009 in hind tibia distinctly expanded on subapical part of dorsal surface (Fig. 6F), but can be distinguished from it by the paramere thick, shorter than aedeagus (Figs. 6D, E). In *A. protuberantis*, the paramere is slender, as long as aedeagus (Figs. 11, 12 in He *et al.* 2009).

Etymology. The specific epithet is a combination of the Latin words: *brevis* + *foliaceus*, referring to the short paramere.

Distribution. China (Yunnan).

8. ***Amiota uncinata* sp. nov.** (Fig.7)

Description. Male terminalia (Figs. 7A–E). Epandrium with ca. 12 setae along posterior to ventral margins. Surstylus with finger-like process at posteroventral corner and ca. 8 long prensisetae on distal margin. Anterior portion of hypandrium broadened and invaginated. Vertical lobe of gonopod sclerotized and round apically. Paramere fused to the base of aedeagus, with ca. 5 sensilla. Aedeagal apodeme strongly curved.

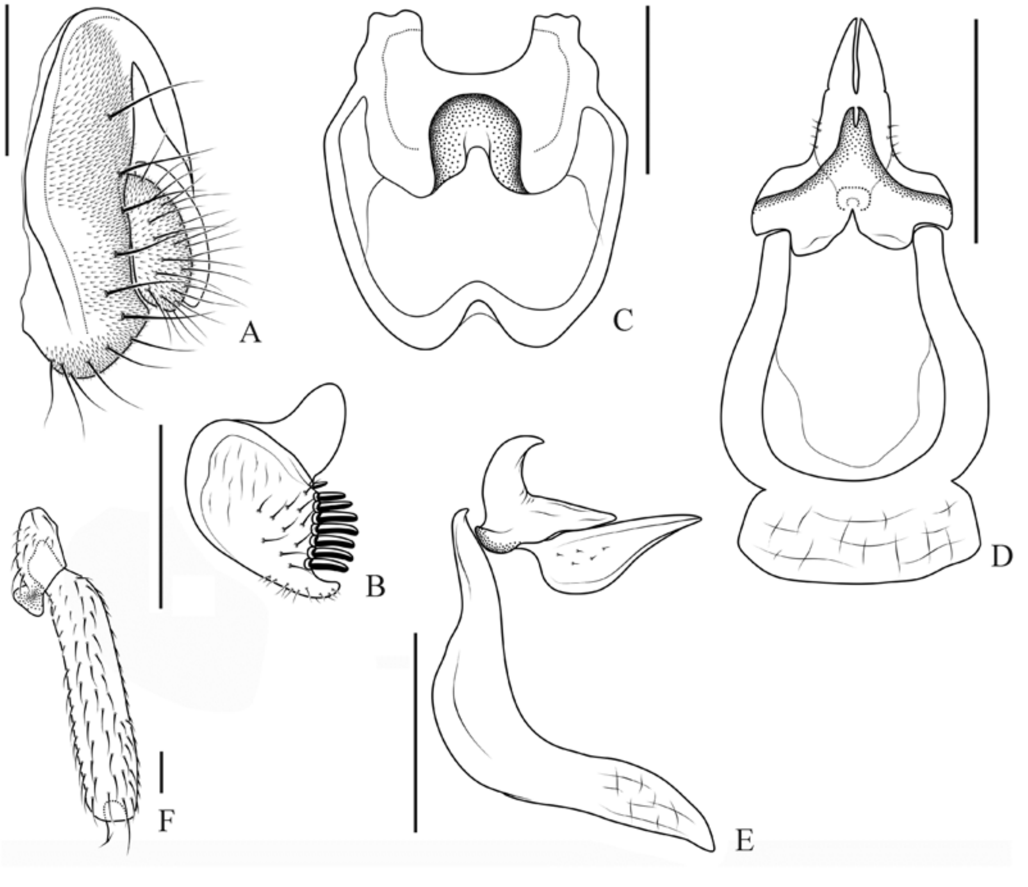

Figure 7. *Amiota uncinata* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D, E. Parameres, aedeagus and aedeagal apodeme, ventral and lateral views; F. Hind femur, postventral view. Scale bars = 0.1 mm.

Measurements and indices. BL = 2.73 mm (2.56–2.59 mm in 5♂ paratypes), ThL = 1.27 mm (1.23–1.26 mm), WL = 2.14 mm (2.04–2.14 mm), WW = 0.99 mm (0.85–0.92 mm), arb = 4/2 (3–4/2), avd = 0.97 (0.74–0.77), adf = 1.30 (1.42–1.43), flw = 1.32 (1.49–1.57), FW/HW = 0.38 (0.37–0.39), ch/o = 0.08 (0.11–0.17), prorb = 0.22 (0.20–0.24), rcorb = 0.85 (0.81–0.85), vb = 0.33 (0.33–0.53), dcl = 0.53 (0.53–0.60), presctl = 0.43 (0.45–0.50), sctl = 1.24 (1.21–1.26), sterno = damaged (0.71–0.96), orbito = 1.98 (1.88–2.37), dcp = 0.22 (0.26–0.29), sctlp = 1.48 (1.07–1.44), C = 1.57 (1.50–1.59), 4c = 1.59 (1.58–1.72), 4v = 2.49 (2.42–2.79), 5x = 1.28 (1.31–1.56), ac = 4.39 (4.64–5.02), M = 0.57 (0.56–0.72), C3F = 0.75 (0.83–0.86).

Holotype. ♂ (SCAU, DIP 112266), **China,** Yunnan, Ruili, Moli Forest Park, 24°07′05″N, 97°58′51″E, alt. 920 m, 23-IV-2018, Hongwei CHEN. **Paratypes.** 1♂ (SCAU, DIP 112267) same data as holotype; 2♂ (SCAU, DIP 112268, 69) **China,** Yunnan, Menglian, Mengma, 22°13′44″N, 99°22′37″E, alt. 1050 m, 14-IV-2018, Hongwei CHEN, Lin ZHU; 1♂ (SCAU, DIP 112270), **China,** Yunnan, Pu′er, Yixiang, 22°44′19″N, 101°07′01″E, alt. 1400 m, 13-V-2012, Hongwei CHEN; 1♂ (SCAU, DIP 112271), **China,** Yunnan, Ximeng, Muyiji, 22°37′15″N, 99°35′42″E, alt. 1203 m, 29-IV-2016, Lin ZHU.

Diagnosis. This species is related to *A. bachlii* Cao & Chen, 2009 in male terminalia, but can be distinguished from it by the paramere distally gradually tapered and aedeagus basally unciform (Figs. 7D, E). In *A. bachlii*, the paramere is distally acute and narrow and aedeagus basally not unciform (Figs. 15, 16 in He *et al.* 2009).

Etymology. The specific epithet derives from the Latin word *uncinus*, referring to the aedeagus basally unciform.

Distribution. China (Yunnan).

Uncertain affinity in *Amiota*

9. ***Amiota bifoliacea*** **sp. nov.** (Fig. 8)

Description. Male terminalia (Figs. 8A–D). Epandrium with ca. 13 setae near posterior to ventral margins. Surstylus with finger-like process at posteroventral corner and ca. 9 long prensisetae on distal margin. Vertical lobe of gonopod sclerotized and pointed apically. Paramere lacking trichoid sensillum. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 2.70 mm (2.67–2.75 mm in 5♂, 3.00 mm in 1♀ paratypes), ThL = 1.27 mm (1.17–1.30 mm, 1.43 mm), WL = 2.60 mm (2.17–2.80 mm, 2.50 mm), WW = 1.07 mm (1.03–1.07 mm, 1.20 mm), arb = 5/4 (4–5/3–4), avd = 0.29 (0.29–0.43), adf = 1.40 (1.20–1.60), flw = 2.00 (1.60–2.20), FW/HW = 0.39 (0.39–0.48), ch/o = 0.05 (0.06–0.11), prorb = 1.09 (0.53–1.10), rcorb = 0.60 (0.64–0.90), vb = 0.50 (0.29–0.50), dcl = 0.67 (0.56–0.67), presctl = 0.53 (0.47–0.63), sctl = 0.88 (0.73–1.20), sterno = damaged (0.73–0.83), orbito = 1.33 (1.60–1.80), dcp = 0.25 (0.22–0.31), sctlp = 1.20 (1.00–1.40), C = 2.00 (1.71–2.28), 4c = 1.82 (1.46–1.82), 4v = 3.00 (2.54–3.00), 5x = 1.00 (1.00–1.43), ac = 4.00 (3.60–5.00), M = 0.64 (0.54–0.82), C3F = 0.83 (0.74–0.81).

Holotype. ♂ (SCAU, DIP 122879), **China,** Yunnan, Menghai, Hesong, 21°50′17″N, 100°05′48″E, alt. 1600 m, 17-IV-2010, Jianjun GAO. **Paratypes.** 10♂1♀ (SCAU, DIP 122880–87; 3♂1♀, 17-IV-2010; 4♂, 13-V-2012; 3♂ saved in the Kunming Institute of Zoology of the Chinese Academy of Sciences), same data as holotype, Jianjun GAO & Hongwei CHEN; 3♂ (SCAU, DIP 122888–90), **China,** Yunnan, Ximeng, Muyiji, 22°37′15″N, 99°35′42″E, alt. 1203 m, 02-IV-2011, Jinming LU.

Diagnosis. This species is analogous to *A. fuscata* Chen & Zhang, 2005 in morphology, but known from the vertical lobe of gonopod with a pair of lobate processes laterally; anterior portion of hypandrium broadly separated (Fig. 8C); paramere thick, shorter than aedeagus, basally fused with each other (Fig. 8D). In *A. fuscata*, the vertical lobe of gonopod has no lobate processes laterally; anterior portion of hypandrium intact; paramere slender, longer than aedeagus (Figs. 21C–E in Chen *et al.* 2005).

Etymology. The specific epithet is a combination of the Latin words: *bi-* + *foliaceus*, referring to the vertical lobe of gonopod with a pair of lobate processes laterally.

Distribution. China (Yunnan).

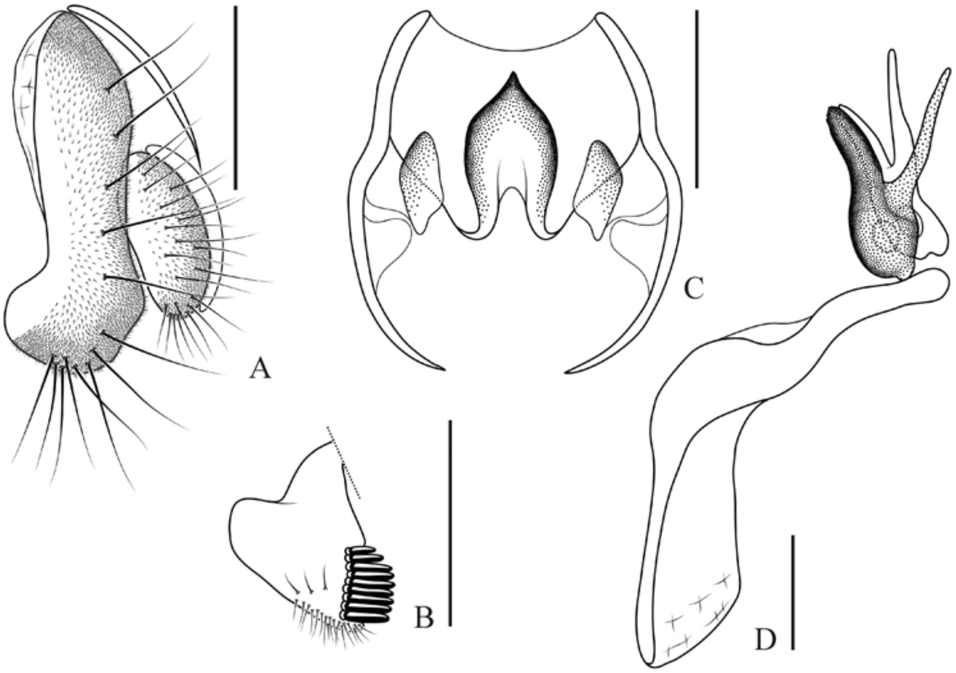

Figure 8. *Amiota bifoliacea* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Parameres, aedeagus and aedeagal apodeme, lateral view. Scale bars = 0.1 mm.

10. ***Amiota geisson*** **sp. nov.** (Fig. 9)

Description. Male terminalia (Figs. 9A–E). Epandrium entirely separated mid-dorsally, with ca. 27 setae along posterior to ventral margins. Surstylus with finger-like process at posteroventral corner and ca. 6 long prensisetae on distal margin. Anterior portion of hypandrium entirely thin. Vertical lobe of gonopod slightly protruded apically. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 2.51 mm, ThL = 1.07 mm, WL = 2.66 mm, WW = 0.95 mm, arb = 5/5, avd = 0.46, adf = 1.23, flw = 1.39, FW/HW = 0.45, ch/o = 0.09, prorb = 0.99, rcorb = 0.64, vb = 0.62, dcl = 0.61, presctl = 0.59, sctl = 1.22, sterno = 0.93, orbito = 1.75, dcp = 0.32, sctlp = 1.21, C = 1.84, 4c = 1.65, 4v = 2.64, 5x = 1.05, ac = 3.84, M = 0.60, C3F = 0.72.

Holotype. ♂ (SCAU, DIP 112272), **China,** Yunnan, Cangyuan, Mengdong, 23°10′08″N, 99°13′52″E, alt. 1323 m, 07-V-2016, Yiqin LIU.

Diagnosis. This species is identified by the paramere less sclerotized, submedially with a rod-like process, distally with 3–4 sensilla and 2 processes on proximal part; aedeagus small, basally fused to the paramere (Figs. 9D, E).

Etymology. The specific epithet is from the Greek word: *geisson*, referring to this species was collected from a border village near Myanmar.

Distribution. China (Yunnan).

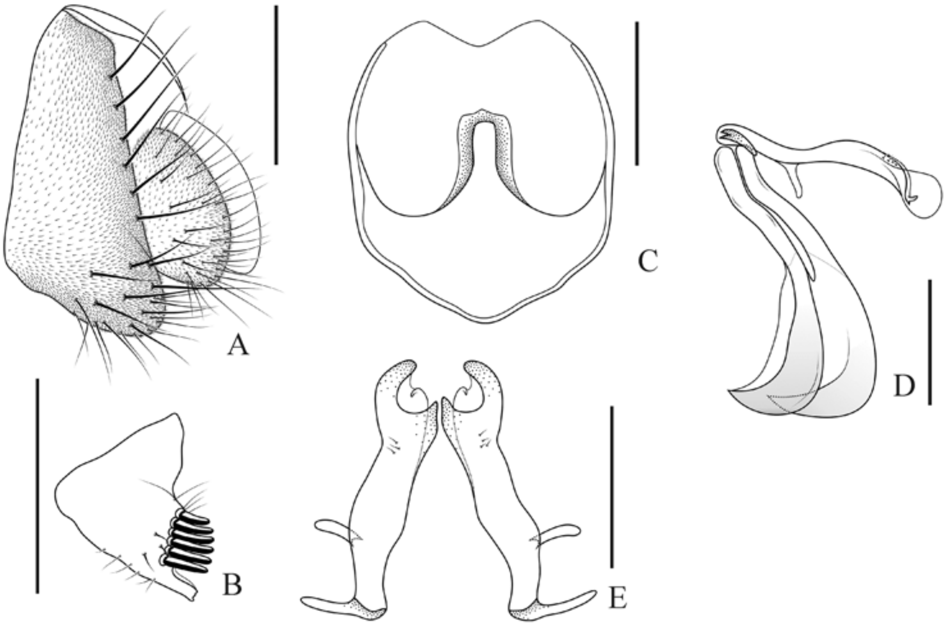

Figure 9. *Amiota geisson* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Parameres, aedeagus and aedeagal apodeme, lateral view; E. Parameres and aedeagus, ventral view. Scale bars = 0.1 mm.

11. ***Amiota nulliseta*** **sp. nov.** (Fig. 10)

Description. Male terminalia (Figs. 10A–E). Epandrium with no constriction mid-dorsally, with ca. 19 setae along posterior to ventral margins. Surstylus with ca. 7 long prensisetae on distal margin. Anterior portion of hypandrium entirely thin. Vertical lobe of gonopod hollowed medially. Aedeagus strongly sclerotized, fused to the base of paramere. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 2.29 mm, ThL = 1.09 mm, WL = 1.71 mm, WW = 0.85 mm, arb = 5/4, avd = 0.50, adf = 0.92, flw = 1.38, FW/HW = 0.45, ch/o = 0.14, prorb = 1.05, rcorb = 0.71, vb = 0.48, dcl = 0.53, presctl = 0.49, sctl = 1.19, sterno = 0.83, orbito = 1.42, dcp = 0.30, sctlp = 0.93, C = 2.28, 4c = 1.54, 4v = 2.66, 5x = 1.39, ac = 2.62, M = 0.76, C3F = 0.62.

Holotype. ♂ (SCAU, DIP 112273), **China,** Yunnan, Pu′er, Yixiang, 22°44′19″N, 101°07′01″E, alt. 1400 m, 13-V-2012, Hongwei CHEN.

Diagnosis. This species can be distinguished from others by the paramere strongly sclerotized, basally with two zygomorphic tapering processes and distally obtuse (Figs. 10D, E).

Etymology. The specific epithet is a combination of the Latin words: *nullus* + *setae,* referring to the paramere lacking trichoid sensillum.

Distribution. China (Yunnan).

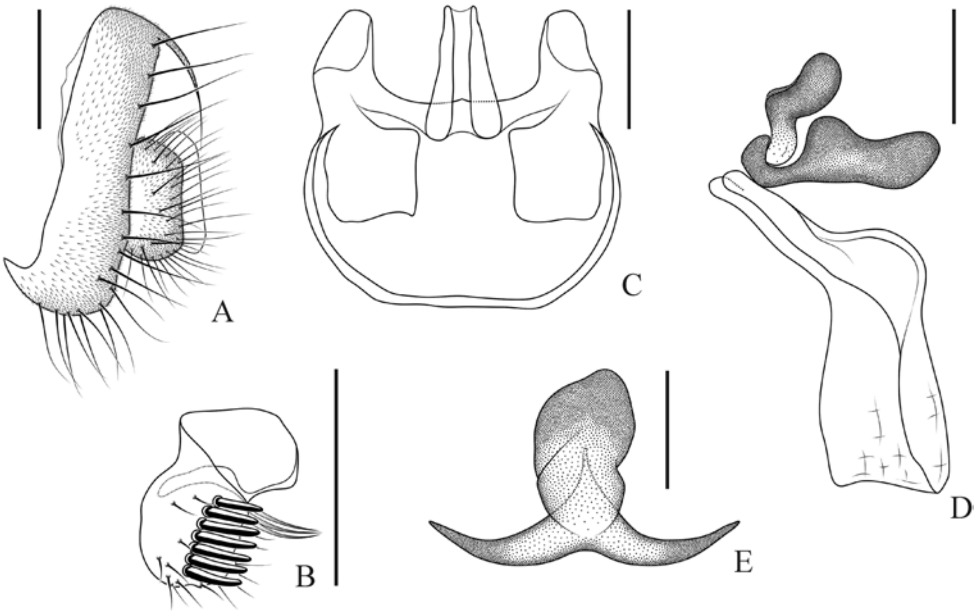

Figure 10. *Amiota nulliseta* **sp. nov.** A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Parameres, aedeagus and aedeagal apodeme, lateral view; E. Parameres and aedeagus, ventral view. Scale bars = 0.1 mm.

12. ***Amiota policladia* sp. nov.** (Figs. 11A–E)

Description. Male terminalia (Figs. 11A–E). Epandrium entirely separated mid-dorsally, with ca. 30 setae along posterior to ventral margins. Surstylus with sparse pubescence dorsally on mesal surface, finger-like process at posteroventral corner and ca. 10 long prensisetae on distal margin. Anterior portion of hypandrium thin. Paramere strongly sclerotized, laterally with two processes and ca. 4 sensilla. Aedeagus basally fused to paramere and distally bifurcated. Aedeagal apodeme strongly curved.

Measurements and indices. BL = 2.97 mm (2.68–2.85 mm in 5♂ paratypes), ThL = 1.23 mm (1.19–1.25 mm), WL = 2.55 mm (2.46–2.57 mm), WW = 1.28 mm (1.12–1.26 mm), arb = 6/6 (6–7/6–7), avd = 0.63 (0.50–0.59), adf = 0.65 (0.61–0.65), flw = 1.27 (1.04–1.16), FW/HW = 0.47 (0.45–0.49), ch/o = 0.20 (0.16–0.20), prorb = 1.01 (0.89–1.02), rcorb = 0.78 (0.76–0.98), vb = 0.44 (0.35–0.41), dcl = 0.54 (0.57–0.61), presctl = 0.42 (0.42–0.72), sctl = 1.35 (1.08–1.49), sterno = 0.89 (0.99–1.04), orbito = 1.57 (1.61–1.76), dcp = 0.35 (0.35–0.40), sctlp = 0.87 (0.81–0.99), C = 1.92 (1.76–1.89), 4c = 1.64 (1.63–1.76), 4v = 2.78 (2.66–2.79), 5x = 1.78 (1.40–1.65), ac = 3.67 (3.79–4.38), M = 0.88 (0.64–0.81), C3F = 0.41 (0.31–0.44).

Holotype. ♂ (SCAU, DIP 112254), **China,** Sichuan, Yajiang, Gexigou, 30°02′58″N, 100°57′36″E, alt. 2800 m, 04-VI-2018, Lu GONG. **Paratypes.** 5♂ (SCAU, DIP 112255–59), same data as holotype, 09-VII-2017, 04-VI-2018.

Diagnosis. This species resembles *A. albidipuncta* Xu & Chen, 2007 in male terminalia, but can be distinguished from it by the vertical lobe of gonopod with degraded middle lobe apically (Fig. 11C). In *A. albidipuncta*, the vertical lobe of gonopod with developed middle lobe apically (Fig. 11F).

Etymology. The specific epithet is a combination of the Greek words: *polys* + *clado-*, referring to the aedeagus having multiple processes.

Distribution. China (Sichuan).

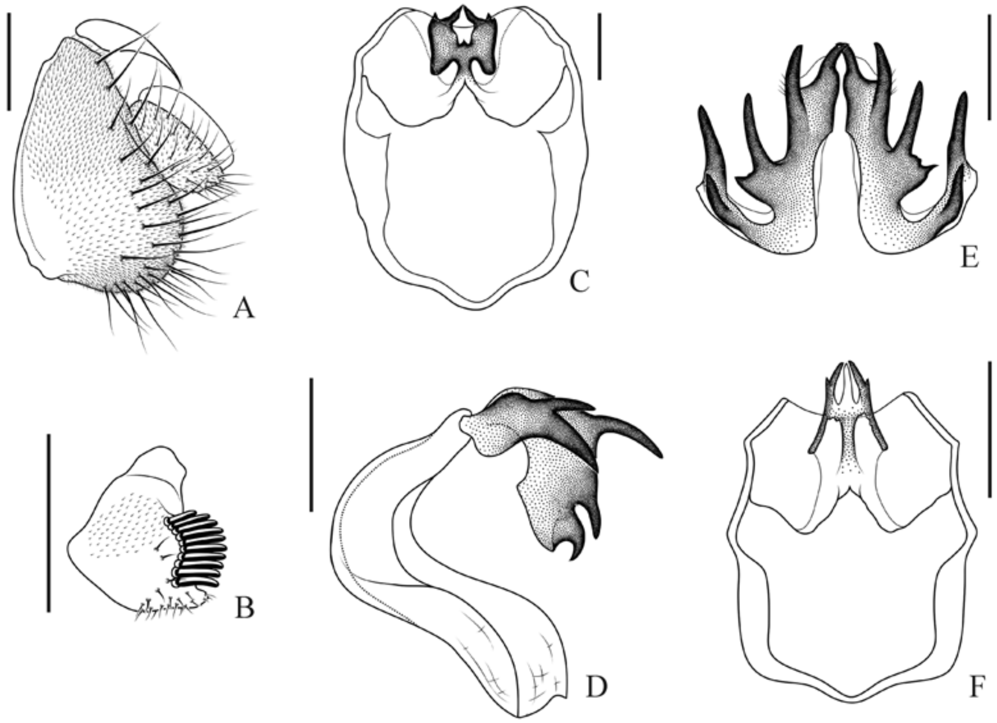

Figure 11. A–E: *Amiota policladia* **sp. nov.**, F: *Amiota albidipuncta* Xu & Chen, 2007. A. Epandrium and cercus, lateral view; B. Surstylus and 10th sternite, ventral view; C. Hypandrium and gonopod, ventral view; D. Parameres, aedeagus and aedeagal apodeme, lateral view; E. Parameres and aedeagus, ventral view; F. Hypandrium and gonopod, ventral view. Scale bars = 0.1 mm.

Acknowledgements

We thank all the members of our laboratory (SCAU) for their help in the lab and fieldwork. Special thanks are due to Dr. M. M. HSUEH (Biodiversity Research Museum, Academia Sinica, Taiwan) for helping us in checking specimens. This work is supported by the National Natural Science Foundation of China (31672321, 31093430).

References

Bächli G. 2020. *The Database on Taxonomy of Drosophilidae*. Available from: http://taxodros.uzh.ch/ (Accessed 15 April 2020).

Brake I & Bächli G. 2008. Drosophilidae (Diptera). *In*: Brake I & Bächli G (Eds.), *World Catalogue of Insects,* *Vol. 9*. Apollo Books, Stenstrup, pp. 249–257.

Cao HL, Li T, Zhang WX & Chen HW. 2008. Five new species and five new records of *Amiota* Loew (Diptera: Drosophilidae) from Hengduan Mountains, southwest China. *Oriental Insects*, 42: 193–205.

Cao HL, Wang XL, Gao JJ, Prigent SR, Watabe H, Zhang YP & Chen HW. 2011. Phylogeny of the African and Asian *Phortica* (Drosophilidae) deduced from nuclear and mitochondrial DNA sequences. *Molecular Phylogenetics and Evolution*, 61: 677–685.

Chen HW & Toda MJ. 1998a. *Amiota* (*Amiota*) *apodemata* species-group, with descriptions of two new species from Southeast Asia (Diptera: Drosophilidae). *Entomological Science*, 1: 271–275.

Chen HW & Toda MJ. 1998b. *Amiota* (*Amiota*) *sinuata* species-group, with descriptions of five new species from Southeast Asia (Diptera: Drosophilidae). *Entomological Science*, 1: 409–416.

Chen HW & Toda MJ. 2001. A revision of the Asian and European species in the subgenus *Amiota* Loew (Diptera, Drosophilidae) and the establishment of species-groups based on phylogenetic analysis. *Journal of Natural History*, 35: 1517–1563.

Chen HW, Watabe HA, Gao JJ, Takamori H, Zhang YP & Aotsuka T. 2005. Species diversity of the subgenus *Amiota* (s. str.) Loew, 1862 (Diptera, Drosophilidae) in southern China. *Journal of Natural History*, 39: 265–310.

Folmer O, Black M, Hoeh W, Lutz R & Vrijenhoek R. 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology*, 3: 294–299.

He HF, Jiang JJ, Cao HZ & Chen HW. 2009. Taxonomy and molecular phylogeny of the *Amiota nagatai* species group (Diptera: Drosophilidae). *Zootaxa*, 2193: 53–61.

Li T, Gao JJ, Lu JM, Ji XL & Chen HW. 2013. Phylogenetic relationship among East Asian species of the *Stegana* genus group (Diptera, Drosophilidae). *Molecular Phylogenetics and Evolution*, 66: 412–416.

Loew H. 1862. Diptera Americae septentrionalis indigena. Centuria secunda. *Berliner Entomologische Zeitschrift*, 6: 185–232.

Lu JM, Zhang Y & Chen HW. 2018. Integrative taxonomy of the genus *Pseudostegana* (Diptera, Drosophilidae) from China, with descriptions of eleven new species. *PeerJ*, 6: e5160.

Máca J. 1980. European species of the subgenus *Amiota* s. str. (Diptera, Drosophilidae). *Acta Entomologica Bohemoslovaca*, 77: 328–346.

Máca J. 2003. Taxonomic notes on the genera previously classified in the genus *Amiota* Loew (Diptera: Drosophilidae, Steganinae). *Acta Universitatis Carolinae Biologica*, 47: 247–274.

Máca J & Lin FJ. 1993. The Drosophilidae of Taiwan: genera *Amiota* (excluding subgenus *Phortica*) and *Leucophenga* (*Nankangomyia* subg. nov.). *Bulletin of the Institute Zoology*, Academia Sinica, 32: 1–11.

McAlpine JF. 1981. Morphology and terminology—adults. *In*: McAlpine JF, Peterson BV, Shewell GE, Teskey HJ, Vockeroth JR & Wood DM (Eds.), *Manual of Nearctic Diptera, Vol. 1*. Minister Supply and Services Canada, Ottawa, pp. 9–63.

Puillandre N, Lambert A, Brouillet S & Achaz G. 2012. ABGD, automatic barcode gap discovery for primary species delimitation. *Molecular Ecology*, 21: 1864–1877.

Shao ZF, Li T, Jiang JJ, Lu JM & Chen HW. 2014. Molecular phylogenetic analysis of the *Amiota taurusata* species group within the Chinese species, with descriptions of two new species. *Journal of Insect Science*, 14: 1–13.

Tamura K, Peterson D, Peterson N, Stecher G, Nei M & Kumar S. 2011. MEGA5: molecular evolutionary genetics analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods. *Molecular Biology and Evolution*, 28: 2731–2739.

Wang YL, Cao HL & Chen HW. 2020. Molecular phylogeny and species delimitation of *Amiota alboguttata* and *Amiota basdeni* species groups (Diptera: Drosophilidae) from East Asia. *Zoological Journal of the*

Linnean Society, 189: 1370–1397.

Wheeler MR. 1952. The Drosophilidae of the Nearctic Region, exclusive of the genus *Drosophila*. *Studies in the Genetics of Drosophila*, 5204: 162–218.

Xu XY & Chen HW. 2013. Five new species and two newly recorded species in the genus *Amiota* (Diptera: Drosophilidae) from China. *Entomotaxonomia*, 35: 57–67.

Xu MF, Gao JJ & Chen HW. 2007. Genus *Amiota* Loew (Diptera: Drosophilidae) from the Qinling mountain system, central China. *Entomological Science*, 10: 65–71.

Zhang WX & Chen HW. 2006. The genus *Amiota* (Diptera: Drosophilidae) from Hengduan Mountains, southwestern China. *European Journal of Entomology*, 103: 483–495.

Zhao F, Xu XY, Jiang JJ, He XF & Chen HW. 2013. Molecular phylogenetic analysis of the *Amiota apodemata* and *Amiota sinuata* species groups (Diptera: Drosophilidae), with descriptions of four new species. *Zoological Journal of the Linnean Society*, 168: 749–858.